What is claimed is:

1. A fuel cell system, comprising:

a fuel cell, a fuel supply, an oxidant supply, a power demand sensor, a heat demand sensor, and a controller;

wherein the fuel cell is adapted to receive a fuel flow from the fuel supply, and an oxidant flow from the oxidant supply;

wherein the controller is connected to each of the fuel supply, oxidant supply, power demand sensor, and heat demand sensor, and wherein the controller is further adapted to receive a power demand signal from the power demand sensor and a heat demand signal from the heat demand sensor;

wherein the controller is adapted to reduce at least one of the fuel flow and oxidant flow when there is no heat demand signal and no power demand signal;

wherein the controller is adapted to increase at least one of the fuel flow and oxidant flow when there is no heat demand signal and there is a power demand signal;

wherein the controller is adapted to increase at least one of the fuel flow and oxidant flow when there is no power demand signal and there is a heat demand signal; and

wherein the controller is adapted to increase at least one of the fuel flow and oxidant flow when there is a power demand and a heat demand signal.

2. The system of claim 1, wherein the power demand sensor is a fuel cell voltage sensor that produces a power demand signal when a voltage of the fuel cell falls below a predetermined level.

3. The system of claim 1, wherein the power demand sensor is a fuel cell current sensor that produces a power demand signal when an output current of the fuel cell exceeds a predetermined level.

4. The system of claim 1, wherein the power demand sensor comprises a fuel cell output current sensor an electrical load sensor, wherein the power demand sensor produces a power demand signal when an electrical load on the fuel cell exceeds an output current of the fuel cell.

5. The system of claim 4, wherein the electrical load on the fuel cell comprises a parasitic system electrical load and an application electrical load.

6. The system of claim 1, further comprising a coolant circuit and a heat sink, wherein the coolant circuit is adapted to transfer heat from the fuel cell to the heat sink; and

wherein the heat demand sensor is a temperature sensor that produces a heat demand signal when a temperature of the heat sink is below a predetermined level.

7. The system of claim 1, further comprising a heat sink, a coolant circuit, and an oxidizer adapted to oxidize an exhaust gas of the fuel cell;

wherein the coolant circuit is adapted to transfer heat from the fuel cell to the heat sink; and

wherein the heat demand sensor is a temperature sensor that produces a heat demand signal when a temperature of the heat sink is below a predetermined level.

8. The system of claim 1, further comprising a coolant circuit and a radiator;

wherein the coolant circuit is adapted to transfer heat from the fuel cell to the heat sink; and

wherein the radiator is adapted to remove heat from the coolant circuit.

9. The system of claim 8, wherein the radiator comprises a fan connected to the controller, and wherein the controller is adapted to reduce an output of the fan when there is a heat demand signal, and the controller is further adapted to increase an output of the fan when there is no heat demand signal.

10. The system of claim 8, wherein the coolant circuit further comprises a bypass valve and a radiator bypass circuit;

wherein the valve is connected to the controller, and the controller is adapted to actuate the valve to divert a coolant flow from the radiator to the radiator bypass circuit when there is a heat demand signal, and the controller is further adapted to actuate the valve to divert the coolant flow from the radiator bypass circuit to the radiator when there is no heat demand signal.

11. The system of claim 6, wherein the heat sink is a water tank.

12. The system of claim 7, wherein the heat sink is a water tank.

13. The system of claim 6, wherein the heat sink comprises air contained in a building.

14. The system of claim 6, wherein the heat sink comprises a generator portion of an adsorption cooling system.

15. The system of claim 7, wherein the heat sink comprises air contained in a building.

16. The system of claim 7, wherein the heat sink comprises a generator portion of an adsorption cooling system.

17. The system of claim 6, wherein the heat sink comprises air

contained in a building and the heat demand sensor is a thermostat that produces a heat demand signal when a temperature of the air falls below a predetermined level.

18. The system of claim 7, wherein the heat sink comprises air contained in a building and the heat demand sensor is a thermostat that produces a heat demand signal when a temperature of the air falls below a predetermined level.

19. The system of claim 7, further comprising a valve and a fuel bypass circuit;

wherein the valve is connected to the controller, and the fuel bypass circuit is adapted to divert a portion of the fuel flow from an inlet of the fuel cell to the oxidizer; and

wherein the controller is adapted to actuate the valve to divert the portion of fuel flow from the fuel cell inlet to the oxidizer when there is a heat demand signal, and the controller is further adapted to actuate the valve to divert the portion of fuel flow from the fuel cell inlet to the oxidizer when there is no heat demand signal.

20. The system of claim 1, wherein the controller comprises a computer usable medium having computer readable code embodied thereon.

21. The system of claim 1, wherein the controller is programmable.

22. A method of operating a fuel cell system, comprising:

providing a fuel flow and an oxidant flow to a fuel cell to produce electricity;

providing the electricity to an electrical load;

transferring heat from the fuel cell to a heat sink by circulating a first coolant through a first coolant circuit, wherein the first coolant circuit is

adapted to remove heat from the fuel cell and is further adapted to transfer heat to the heat sink;

measuring a thermal parameter of the heat sink;

measuring an electrical parameter of the electrical load;

measuring a performance parameter of the fuel cell;

generating a power demand signal when a power output of the fuel cell indicated by the performance parameter is less than a power requirement of the electrical load indicated by the electrical parameter;

generating a heat demand signal when the thermal parameter of the heat sink is below a predetermined level;

reducing at least one of the fuel flow and oxidant flow when there is no heat demand signal and no power demand signal;

increasing at least one of the fuel flow and oxidant flow when there is no heat demand signal and there is a power demand signal;

increasing at least one of the fuel flow and oxidant flow when there is no power demand signal and there is a heat demand signal; and

increasing at least one of the fuel flow and oxidant flow when there is a power demand and a heat demand signal.

23. The method of claim 22, further comprising:

measuring a voltage of the fuel cell; and

generating the power demand signal when the voltage of the fuel cell falls below a predetermined level.

24. The method of claim 22, further comprising:

measuring an output current of the fuel cell; and

generating the power demand signal when the output current of the fuel cell exceeds a predetermined level.

25. The method of claim 22, further comprising:

exhausting fuel gas from the fuel cell to an oxidizer;

oxidizing the fuel gas in the oxidizer to generate heat; and

transferring heat from the fuel cell to the heat sink by circulating a second coolant through a second coolant circuit, wherein the second coolant circuit is adapted to remove heat from the oxidizer and is further adapted to transfer heat to the heat sink.

26. The method of claim 22, wherein the first and second coolant circuits are in fluid communication and the first and second coolants are each portions of a common coolant flow.

27. The method of claim 22, further comprising:

circulating the first coolant through a radiator to remove heat from the first coolant.

28. The method of claim 22, further comprising:

circulating the second coolant through a radiator to remove heat from the first coolant.

29. The method of claim 22, wherein the heat sink comprises a water tank, and wherein the thermal parameter is a temperature of water in the water tank.

30. The method of claim 22, wherein the heat sink comprises air contained in a building, and wherein the thermal parameter comprises a temperature of the air contained in the building.

31. The method of claim 22, wherein the heat sink comprises a generator portion of an adsorption cooling system and wherein the thermal parameter is a temperature of the generator portion.

32. The system of claim 22, further comprising:

diverting a portion of the fuel flow from an inlet of the fuel cell to the oxidizer in response to the heat demand signal.

33. A fuel cell system, comprising:

a fuel cell, a fuel processor, an oxidant supply, a power demand sensor, a heat demand sensor, a controller, and an electrochemical hydrogen separator;

wherein the fuel cell is adapted to receive a fuel flow from the fuel processor, and an oxidant flow from the oxidant supply;

wherein the controller is connected to each of the fuel supply, oxidant supply, power demand sensor, and heat demand sensor, and wherein the controller is further adapted to receive a power demand signal from the power demand sensor and a heat demand signal from the heat demand sensor;

wherein the hydrogen separator is adapted to receive the fuel flow from the fuel processor and separate hydrogen from the fuel flow into a reservoir when the hydrogen separator is activated;

wherein the controller is adapted to reduce at least one of the fuel flow and oxidant flow when there is no heat demand signal and no power demand signal;

wherein the controller is adapted to increase at least one of the fuel flow and oxidant flow when there is no heat demand signal and there is a power demand signal;

wherein the controller is adapted to activate the hydrogen separator when there is no power demand signal and there is a heat demand signal; and

wherein the controller is adapted to increase at least one of the fuel flow and oxidant flow when there is a power demand and a heat demand signal.

34. The system of claim 33, wherein the power demand sensor is a fuel cell voltage sensor that produces a power demand signal when a voltage

of the fuel cell falls below a predetermined level.

35. The system of claim 33, wherein the power demand sensor is a fuel cell current sensor that produces a power demand signal when an output current of the fuel cell exceeds a predetermined level.

36. The system of claim 33, wherein the power demand sensor comprises a fuel cell output current sensor an electrical load sensor, wherein the power demand sensor produces a power demand signal when an electrical load on the fuel cell exceeds an output current of the fuel cell.

37. The system of claim 33, further comprising a coolant circuit and a heat sink, wherein the coolant circuit is adapted to transfer heat from the fuel cell to the heat sink; and

wherein the heat demand sensor is a temperature sensor that produces a heat demand signal when a temperature of the heat sink is below a predetermined level.

38. The system of claim 33, further comprising a heat sink, a coolant circuit, and an oxidizer adapted to oxidize an exhaust gas of the fuel cell;

wherein the coolant circuit is adapted to transfer heat from the fuel cell to the heat sink; and

wherein the heat demand sensor is a temperature sensor that produces a heat demand signal when a temperature of the heat sink is below a predetermined level.

39. The system of claim 33, further comprising a coolant circuit and a radiator;

wherein the coolant circuit is adapted to transfer heat from the fuel cell to the heat sink; and

wherein the radiator is adapted to remove heat from the coolant circuit.

40. The system of claim 39, wherein the radiator comprises a fan connected to the controller, and wherein the controller is adapted to reduce an output of the fan when there is a heat demand signal, and the controller is further adapted to increase an output of the fan when there is no heat demand signal.

41. The system of claim 39, wherein the coolant circuit further comprises a bypass valve and a radiator bypass circuit;

wherein the valve is connected to the controller, and the controller is adapted to actuate the valve to divert a coolant flow from the radiator to the radiator bypass circuit when there is a heat demand signal, and the controller is further adapted to actuate the valve to divert the coolant flow from the radiator bypass circuit to the radiator when there is no heat demand signal.

42. The system of claim 38, wherein the heat sink is a water tank.

43. The system of claim 38, wherein the heat sink comprises air contained in a building.

44. The system of claim 38, wherein the heat sink comprises air contained in a building and the heat demand sensor is a thermostat that produces a heat demand signal when a temperature of the air falls below a predetermined level.

45. The system of claim 33, wherein the reservoir is a pressure vessel.

46. The system of claim 33, wherein the reservoir comprises a valve connected to the controller and associated with a connection to the fuel cell

such that the controller is adapted to selectively open the valve to supply hydrogen to the fuel cell.

47. The system of claim 33, wherein the hydrogen separator comprises a membrane electrode assembly having an anode side and a cathode side;

the anode side being in fluid connection with the fuel flow from the fuel processor;

the anode side and cathode side of the membrane electrode assembly each having an electrical connector; and

a power source connected to the anode and cathode side electrical connectors of the membrane electrode assembly, the power source providing a potential across the connectors.

48. The system of claim 47, wherein the membrane electrode assembly comprises a PEM sandwiched on either side by a platinum based catalyst layer.

49. The system of claim 47, wherein the controller is connected to the power source and adapted to selectively activate the hydrogen separator by causing the power source to apply a potential across the connectors.